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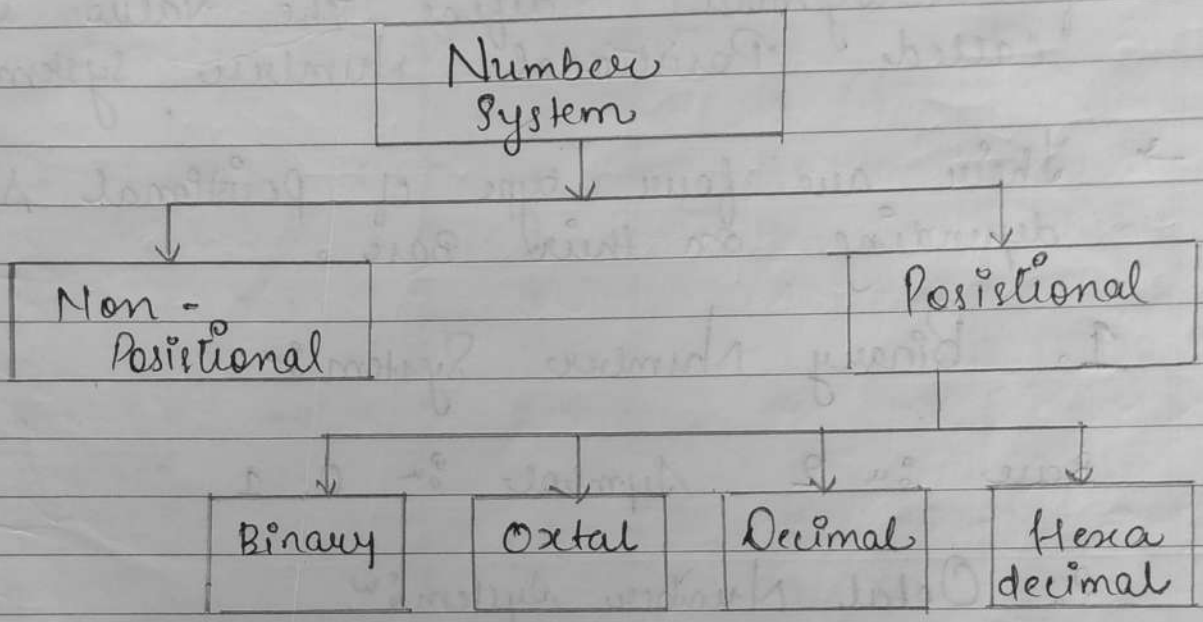
Unit 3 :-

:- Number System :-



* Non Positional Number System :-

→ In this number system each symbol represent the same value, regardless of its position in the number.

→ Disadvantage :-

- It is very difficult to perform Arithmetic Operation with non positional Number system.

* Positional Number System :-

→ The number system, in which position of the symbol define the value is called Positional Number system.

→ Their are four type of positional system depending on their Base.

1. Binary Number System :-

Base :- 2 Symbol :- 0, 1

2. Octal Number System :-

Base :- 8 Symbol :- 0, 1, 2, 3, 4, 5, 6, 7

3. Decimal Number System :-

Base :- 10 Symbol :- 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

4. Hexadecimal Number System :-

Base :- 16 Symbol :- 0, 1, 2, 3, 4, 5, 6, 7, 8, A, B, C, D, E, F

4 2 1
8 4 2 1

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$1^0 = 1$, $2^0 = 1$, $3^0 = 1$, $n^0 = 1$

* Relationship between Decimal, Octal, Hexa-Decimal and Binary :-

Digit	Decimal	Octal	Hexadecimal	Binary.
0	0	0	0	0000
1	1	1	1	0001
2	2	2	2	0010
3	3	3	3	0011
4	4	4	4	0100
5	5	5	5	0101
6	6	6	6	0110
7	7	7	7	0111
8	8		8	1000
9	9		9	1001
10			A	1010
11			B	1011
12			C	1100
13			D	1101
14			E	1110
15			F	1111

10 A

2^1 =

0.
2 | 1

2	1	1
	0	

0
2
0 = 0000
0010

* Types Of Conversion :-

1. Binary to Decimal
2. Octal to Decimal
3. Hexa to Decimal
4. Decimal to Binary
5. Decimal to Octal
6. Decimal to Hexa
7. Binary to Octal
8. Binary to Hexa
9. Octal to Binary
10. Hexa to Binary
11. Octal to Hexa
12. Hexa to Octal

Others to Decimal Method : Multiplication

Decimal to Others Method : Division

Method : Divided into group of three

Method : Divided into group of four

Method :- Divide into group of three

Method :- Divided into group of four

1. Binary to Decimal :-

1. $(1\,0\,0\,1\,1\,1)_2 = (?)_{10}$
   (positions: 5 4 3 2 1 0)

$\Rightarrow$ $(1 \times 2^0) + (1 \times 2^1) + (1 \times 2^2) + (0 \times 2^3) + (0 \times 2^4) + (1 \times 2^5)$

$= (1 \times 1) + (1 \times 2) + (1 \times 4) + (0 \times 8) + (0 \times 16) + (1 \times 32)$

$= 1 + 2 + 4 + 32$

$= 39$

2. $(11010011)_2 = (?)_{10}$
   $_{76543210}$

$= (1\times2^0) + (1\times2^1) + (0\times2^2) + (0\times2^3) +$
$(1\times2^4) + (0\times2^5) + (1\times2^6) + (1\times2^7)$
$= (1\times1) + (1\times2) + (0\times4) + (0\times8) +$
$(1\times16) + (0\times32) + (1\times64) + (1\times128)$
$= 1 + 2 + 16 + 64 + 128$
$= 211$

Ans :- $(11010011)_2 = (211)_{10}$

3. $(11101011)_2 = (?)_{10}$
   $_{76543210}$

$= (1\times2^0) + (1\times2^1) + (0\times2^2) + (1\times2^3) + (0\times2^4) +$
$(1\times2^5) + (1\times2^6) + (1\times2^7)$
$= (1\times1) + (1\times2) + (0\times4) + (1\times8) + (0\times16) +$
$(1\times32) + (1\times64) + (1\times128)$
$= 1 + 2 + 8 + 32 + 64 + 128$
$= 235$

Ans :- $(11101011)_2 = (235)_{10}$

4. Binary to Decimal
Fractional No :-

$(101100.011)_2 = (?)_{10}$
$_{543210\ -1\ -2\ -3}$

101100

$= (0\times2^0) + (0\times2^1) + (1\times2^2) + (1\times2^3) + (0\times2^4) + (1\times2^5)$
$= (0\times1) + (0\times2) + (1\times4) + (1\times8) + (0\times16) + (1\times32)$

$= 4 + 8 + 32$

$= 44$

→ 011

$= (0 \times 2^{-1}) + (1 \times 2^{-2}) + (1 \times 2^{-3})$

$= (0 \times 1/2) + (1 \times 1/4) + (1 \times 1/8)$

$= \frac{1}{4} + \frac{1}{8}$

$= \frac{3}{8}$

$= 0.375$

Ans. $(101100.011) = (44.375)$

5. $(110110.0111)_2 = (?)_{10}$

543210 -1-2-3-4

110110

$= (0 \times 2^0) + (1 \times 2^1) + (1 \times 2^2) + (0 \times 2^3) + (1 \times 2^4) + (1 \times 2^5)$

⇒ 0111

$= (0 \times 2^{-1}) + (1 \times 2^{-2}) + (1 \times 2^{-3}) + (1 \times 2^{-4})$

$= (0 \times 1) + (1 \times 2) + (1 \times 4) + (0 \times 8) + (1 \times 16) + (1 \times 32)$

$= 2 + 4 + 16 + 32$

$= 54$

$= (0 \times 1/2) + (1 \times 1/4) + (1 \times 1/8) + (1 \times 1/16$

$= \frac{1}{4} + \frac{1}{8} + \frac{1}{16}$

$= \frac{4+2+1}{16} = \frac{7}{16} = 0.4375$

Ans. (101100.011)

Ans $(110110.0111)_2 = (54.4375)_{10}$

2. Octal to Decimal :-

1. $(2614)_8 = (?)_{10}$
   3 2 1 0

$= (4 \times 8^0) + (1 \times 8^1) + (6 \times 8^2) + (2 \times 8^3)$
$= (4 \times 1) + (1 \times 8) + (6 \times 64) + (2 \times 512)$
$= 4 + 8 + 384 + 1024$
$= 1420$

Ans: $(2614)_8 = (1420)_{10}$

2. $(562)_8 = (?)_{10}$

$= (2 \times 8^0) + (6 \times 8^1) + (5 \times 8^2)$
$= (2 \times 1) + (6 \times 8) + (5 \times 64)$
$= 2 + 48 + 320$
$= 370$

Ans : $(562)_8 = (370)_{10}$

Fractional No:-

3. $(257.65)_8 = (?)_{10}$

2 1 0

257

$= (7 \times 8^0) + (5 \times 8^1) + (2 \times 8^2)$

$= 7 + 40 + 128 = 175$

0.65

$= (6 \times 8^{-1}) + (5 \times 8^{-2})$

$= (6 \times 1/8) + (5 \times 1/64)$

$= 6/8 + 5/64$

$= \frac{48+5}{64}$

$= \frac{53}{64}$

$= 0.828$

Ans:- $(257)_8 = (175.828)_{10}$

3. Hexa to Decimal :-

1. $(2A3B)_{16} = (?)_{10}$

$= (B \times 16^0) + (3 \times 16^1) + (A \times 16^2) + (2 \times 16^3)$
$= (11 \times 1) + (3 \times 16) + (10 \times 256) + (2 \times 4096)$
$= 11 + 48 + 2560 + 8192$
$= 10811$

Ans :- $(2A3B)_{16} = (10811)_{10}$

2. $(FDE)_{16} = (?)_{10}$

$= (E \times 16^0) + (D \times 16^1) + (F \times 16^2)$
$= (14 \times 16^0) + (13 \times 16) + (15 \times 256)$
$= 14 + 208 + 3840$
$= 4062$

Ans :- $(FDE)_{16} = (4062)_{10}$

⇒ Fractional :-

3. $(A4E.D4)_{16} = (?)_{10}$

A4E

$= (A \times 16^2) + (4 \times 16^1) + (E \times 16^0)$
$= (14 \times 1) + (4 \times 16) + (10 \times 256)$
$= 14 + 64 + 2560$
$= 2638$

D4
-1 -2

$= (13 \times 16^{-1}) + (4 \times 16^{-2})$
$= (13 \times 1/16) + (4 \times 1/256)$
$= \frac{13}{16} + \frac{4}{256}$
$= \frac{208+4}{256}$
$= \frac{212}{256}$
$= 0.828$

Ans: $(A4E.D4)_{16} = (2638.828)_{10}$

4. $(2B.C4)_{16} = (?)_{10}$

2B
$= (B \times 16^{0}) + (2 \times 16^{1})$
$= (11 \times 1) + (2 \times 16)$
$= 11 + 32$
$= 43$

C4
$= (C \times 16^{-1}) + (4 \times 16^{-2})$
$= (12 \times 1/16 + (4 \times 1/256)$
$= \frac{12}{16} + \frac{4}{256}$
$= \frac{192+4}{256}$
$= 0.765$

$(2B.C4)_{16} = (43.765)_{10}$

4. Decimal to Binary :-

1. $(952)_{10} = (?)_2$

2	952	0
2	476	0
2	238	0
2	119	1
2	59	1
2	29	1
2	14	0
2	7	1
2	3	1
	1	

$(952)_{10} = (1110111000)_2$.

2. $(428)_{10} = (?)_2$

2	428	0
2	214	0
2	107	1
2	53	1
2	26	0
2	13	1
2	6	0
2	3	1
	1	

$(428)_{10} = (110101100$

→ Fractional No:-

1. $(247.65)_{10} = (?)_2$

2	247	1
2	123	1
2	61	1
2	30	0
2	15	1
2	7	1
2	3	1
	1	

$0.65 \times 2 = 1.30 = 1$
$0.30 \times 2 = 0.60 = 0$
$0.60 \times 2 = 1.20 = 1$
$0.20 \times 2 = 0.40 = 0$
$0.40 \times 2 = 0.80 = 0$

Ans:- $(247.65)_{10} = (11110111.10100)_2$.

2. $(125.46)_{10} = (?)_2$

2	125	1
2	62	0
2	31	1
2	15	1
2	7	1
2	3	1
	1	

$0.46 \times 2 = 0.92 = 0$
$0.92 \times 2 = 1.84 = 1$
$0.84 \times 2 = 1.68 = 1$
$0.68 \times 2 = 1.36 = 1$
$0.36 \times 2 = 0.72 = 0$

Ans:- $(125.46)_{10} = (1111101.01110)_2$

6. Decimal to Hexa :-

1. $(435)_{10} = (?)_{16}$

16	435	3
16	27	11
	1	

$(435)_{10} = (1B3)_{16}$

→ fractional no :-

$(931.62)_{10} = (?)_{16}$

16	931	3
16	58	10
	3	

$0.62 \times 16 = 9.92 = 9$
$0.92 \times 16 = 14.72 = 14$ E
$0.72 \times 16 = 11.52 = 11$ B
$0.52 \times 16 = 8.32 = 8$
$0.32 \times 16 = 5.12 = 5$

Ans :- $(931.62)_{10} = (3A3.9EB85)_{16}$

$(3233.56)_{10} = (?)_{16}$

16	3233	1
16	202	10
	12	

$0.56 \times 16 = 6$

$(CA1.8F5C)_{16}$

16
3
48
3 3
0.56
× 16
560
336
96

7. Binary to Octal :- (421 Method)

2 1 2 0
2 2 2
4 2 1

1. $(1010101100)_2 = (?)_8$

1,010,101,100
1 2 5 4

$(1010101100)_2 = (1254)_8$

2. $(10110011001)_2 = (?)_8$

10,110,011,001
2 6 3 1

Ans :- $(10110011001) = (2631)_8$

(11010)
(11010)
(10110011)
(11011101)

3. $(1101011)_2 = (?)_8$

1,101,011
1 5 3

Ans :- $(1101011)_2 = (153)_8$

4. $(11010)_2 = (?)_8$

11,010
3 2

Ans :- $(11010)_2 = (32)_8$

5. $(10110011)_2 = (?)_8$

1	0	1	1	0	0	1	1
	2		6		3		

Ans:- $(10110011)_2 = (263)_8$

6. (11011101)

1	1	0	1	1	1	0	1
	3		3		5		

Ans:- $(11011101)_2 = (335)_8$

Binary To Octal :-

→ Fractional No :-

1. $(11010110.1001)_2 = (?)_8$

11,010,110 . 1001

3 2 6 . 11

$(11010110.1001)_2 = (326.44)_8$

2. $(11011101.10110)_2 = (?)_8$

011,011,101 . 101,10

3 3 5 . 5 4

$(11011101.10110)_2 = (335.54)_8$

8. Binary to Hexa :- (8421 Method).

1. $(101100011100)_2 = (?)_{16}$

1011,0001,1100

8421 8421 8421

5 8 12

Ans :- $(101100011100)_2 = (58C)_{16}$

2. $(1010101100)_2 = (?)_{16}$

10,1010,1100
8421 8421 8421

2 10 12

Ans:- $(1010101100)_2 = (2AC)_{16}$

→ Fractional No :-

3. $(\overleftarrow{11100101}).(\overrightarrow{11011})_2 = (?)_{16}$

1110,0101 . 1101,1000
8421 8421 8421 8421

14 5 . 13 8
E D 8

Ans:- $(11100101.11011)_2 = (E5.D8)_{16}$

9. Octal to Binary :-

1. $(1234)_8 = (?)_2$

1 2 3 4
001 010 011 100

Ans:- $(1234)_8 = (001010011100)_2$

2. $(2573)_8 = (?)_2$

2	5	7	3
010	101	111	011

Ans :- $(2573)_8 = (010101111011)_2$.

⇒ Fractional No. :-

1. $(2614.435)_8 = (?)_2$.

2	6	1	4	.	4	3	5
010	110	001	100	.	~~100~~ 001	~~011~~ 110	~~101~~ 100 011 101

Ans :- $(010110001100.001110101)_2$.

10. Hexa to Binary :-

1. $(FA7)_{16} = (?)_2$

F	A	7
1111	1010	0111

Ans :- $(FA7)_{16} = (111110100111)_2$

2. $(1AC)_{16} = (?)_2$

1	A	C
0001	1010	1100

Ans :- $(1AC)_{16} = (0001\ 1010\ 1100)_2$

3. $(BCA)_{16} = (?)_2$

B C A
1011 1100 1010

Ans :- $(BCA)_{16} = (101111001010)_2$

→ Fractional No :-

1. (2A2B.B4)

2 A 2 B . B 4
0010 1010 0010 1011 . 1011 0100

Ans :- (2A2B.B4) = (0010101000101011.10110100

11. Hexa to Octal :-

→ 1. It is a two step method.
Step 1 :- Hexa to Binary
Step 2 :- Binary to Octal.

1. $(BCA)_{16} = (?)_8$

→ Step 1 :- $(BCA)_{16} = (?)_2$

B(11) C(12) A(10)
8 4 2 1 8 4 2 1 8 4 2 1
1011 1100 1010

→ $(BCA)_{16} = (101111001010)_2$

Step 2 :- $(101111001010)_2 = (?)_8$

101,111,001,010
5 7 1 2

Ans:- $(B(A)_{16} = (5712)_8$

2. $(A2DE)_{16} = (?)_8$

Step 1:-

$(A\ 2\ D\ E)_{16} = (?)_2$

A (10) 2 D (13) E (14)

1010 0010 1101 1110

$\Rightarrow (A2DE)_{16} = (1010001011011110)_2$

Step 2:-

$(1010001011011110)_2 = (?)_8$

1,010,001,011,011,110

1 2 1 3 3 6

Ans:- $(A2DE)_{16} = (1213366)_8$

3. $(A37E)_{16} = (?)_8$

A 3 7 E

↓ ↓

10 14

10 3 7 14

Step 1:- $(10\ 3\ 7\ 14)_{16} = (?)_2$.

1010 0011 0111 1110

$(A37E)_{16} = (1010001101111110)_2$

Step 2:- $(1010001101111110)_2 = (?)_8$

1,010,001,101,111,110

1 2 1 5 7 6

$\boxed{(A37E)_{16} = (121576)_8}$

4. $(2BC4)_{16} = (?)_8$

2 B C 4
11 12

Step1:- 2 11 12 4 = $(?)_2$

0010 1011 1100 0100

Step2:- $(0010101111000100)_2 = (?)_8$

0 0 1 0 , 1 0 1 1 , 1 1 0 0 , 0 1 0 0

2 5 7 0 4

$(2BC4)_{16} = (25704)_8$

⇒ Fractional No:-

1. $(D3.4C)_{16} = (?)_8$

Step1:- D3 . 4C

13 12

13 3 . 4 12 = $(?)_2$

1101 0011 . 0100 1100

11,010,011 . 010,011,00

3 2 3 . 2 3

Ans:- $(D3.4C)_{16} = (323.23)_8$

2. $(1A.34)_{16} = (?)_8$

1 A . 3 4
↓
10

Step 1. 1 10 . 3 4 = (?)2
0001 1010 . 0011 0100

000,11,010 . 001,101,00
0 3 2 . 1 5

Ans :- $(1A.34) = (032.15)_8$

12. Octal to Hexa :-

1. $(6357)_8 = (?)_{16}$

Step 1 :- 6 3 5 7
110 011 101 111

1100,1110,1111
12 14 15
C E F

$(6357)_8 = (CEF)_{16}$

2. $(2761)_8 = (?)_{16}$

Step 1 :-

2	7	6	1
010	111	110	001

Step 2 :- 010111110001

5	15	1
	F	

$(2761)_8 = (5F1)_{16}$

→ Fractional No. :-

1. $(1670.34)_8 = (?)_{16}$

Step 1 :-

1	6	7	0	.	3	4
001	110	111	000	.	011	100

Step 2 :-

0011	1011	1000	.	0111	00
3	11	8	.	7	0
	B				

Ans :- $(1670.34) = (3B8.70)_{16}$

* Binary addition :-

Rules :-

0 + 0 = 0
0 + 1 = 1
1 + 0 = 1
1 + 1 = 0 (carry 1)

1. $(10001)_2 + (11101)_2$

```
  1     1
  1 0 0 0 1
+ 1 1 1 0 1
-----------
1 0 1 1 1 0
```

Ans :- $(10001)_2 + (11101)_2 = (101110)_2$

2. $(100111)_2 + (11011)_2$

```
  1 1 1 1 1 1
  1 0 0 1 1 1
+ 1 1 0 1 1
-----------
1 0 0 0 0 1 0
```

Ans :- $(100111)_2 + (11011)_2 = (1000010)_2$

3. $(1000111)_2 + (1011)_2$

```
    1 1 1 1
  1 0 0 0 1 1 1
    1 0 1 1
  1 0 1 0 0 1 0
```

4. $(100111)_2 + (1111)_2$

```
  1 1 1 1
  1 0 0 1 1 1
+     1 1 1 1
-------------
  1 1 0 1 1 0
```

→ Fractional No. :-

1. $(1101.1)_2 + (1011.1)_2$

```
  1 1 1 1 1
    1 1 0 1 . 1
+   1 0 1 1 . 1
-------------------
  1 1 0 0 1 . 0
```

*. Binary Subtraction :-

Rule :-

0 - 0 = 0
1 - 0 = 1
1 - 1 = 0
0 - 1 = 1 (Borrow 1)

1. $(10010)_2$ from $(1011011)_2$.

```
  1 0 1 1 0 1 1        1 0 1 1 0 1 1
-   1 0 0 1 0      -     1 0 0 1 0
-------------      ---------------
  1 0 0 1 0 0 1        1 0 0 , 0 0 1
```

Multiplication No. :-

$0 \times 0 = 0$
$0 \times 1 = 0$
$1 \times 0 = 0$
$1 \times 1 = 01$

1. $(111)_2$ by $(110)_2$

```
    1 1 1
  x 1 1 0
  -------
    0 0 0
  1 1 1
  -------
  1 0 1 0 1 0
```

Ans :- $(111)_2 \times (110)_2 = (101010)_2$

2. $(00101001)_2$ by $(111)_2$

```
  00101001
  x   111
  --------
    101001
   101001
  101001
  --------
  10001111
```

Ans :- $(00101001)_2$ by $(111)_2 = (10001111)_2$

* Binary Division :-

Rules.

0/1 = 0
1/1 = 0

1. $(10000111)_2$ by $(101)_2$

```
      11011
   ---------
101 | 10000111
      101
      -----
       0100
        101
        ---
         011
          101
          ---
           10
```

Ans:- $(11011)_2$

2. $(1010010)_2$ by $(110)_2$

```
      111
   ---------
110 | 1010010
      110
      ---
       1001
        110
        ---
         011
          110
          ---
           000
```

Ans :- $(111)_2$

* Hexadecimal Arithmetic :-

→ Hexadecimal Addition :-

1. $(FACE)_{16} + (AB17)_{16}$

A = 10 D = 13
B = 11 E = 14
C = 12 F = 15

```
  1   1       1
 (15) (10) (12) (14)
  F    A    C    E
+ A(10) B(11) 1    7
-------------------
 26>16 21>16 14>16 21>16
 -16   -16    E    -16
 ---   ---         ---
 10(A)  5          5
```

Ans :- $(1A5E5)_{16}$

2. $(AC5A9)_{16} + (ED694)_{16}$

```
  1   1
  A(10) C(12) 5   A(10) 9
+ E(14) D(13) 6   9    4
-------------------------
 25>16 25>16 11>16 19>16 13>16
 -16   -16    C    -16    D
 ---   ---         ---
  9     9           3
```

Ans :- $(199C3D)_{16}$

3. $(12.73)_{16} + (FD.B4)_{16}$

1	1	1			
	1	2	.	7	3
	F(15)	D(13)	.	B(11)	4
	17>16	16>16	.	18>16	7>16
	-16	-16		-16	
	1	0		2	

Ans :- $(110.27)_{16}$

→ Hexadecimal Subtraction :-

1. $(ABCD)_{16} - (56CF)_{16}$

				16	16
	A(10)	B(11)		C(12)	D(13)
−	5	6		E(12)	F(15)
	5	4		15	14
				F	E

Ans :- $(54FE)_{16}$

2. $(A27E9)_{16} - (GEB43)_{16}$

	9		16		16	
	A(10)	2	7	E(14)	9	
−	6	E(14)	B(11)	4	3	
	3	3	12C	10A	6	

Ans :- $(33CA6)_{16}$

3. $(7E2CA)_{16} - (1F65)_{16}$

	7	E(14)	2	C(12)	A(10)
−	1	F(15)	6	5	
	7	12	3	6	5
		C			

Ans: $(7C365)_{16}$

4. $(52.33)_{16} - (4F.FF)_{16}$

	5	4		2	1	.	3	2	3
−	4			F(15)		.	F(15)		F(15)
	0			2		.	3		4

Ans: $(52.33)_{16} - (4F.FF)_{16} = (2.34)_{16}$

* Octal Arithmetic

1. $(1670)_8 + (1256)_8$

```
    1 1
  1 6 70
+ 1 2 5 6
-------------
  3 9 8 12 8 6 > 8
```

```
  3  9  12 6
     -8 -8
  3  1  4  6
```

Ans $(1670)_8 + (125)_8 = (3146)_8$

2. $(5647)_8 + (1425)_8$

```
    1     1
  5 6 4 7
+ 1 4 2 5
-------------
  7 > 8  10 > 8  7 > 8  12 > 8
```

7 (10-8) 2 7 (12-8) = 4

Ans :- $(5647)_8 + (1425)_8 = (7274)_8$

⟹ Subtraction :-

1. $(745)_8 - (574)_8$

```
    6 8
  7 4 5
- 5 7 4
-------------
  1 5 1
```

$= (151)_8$

* Complementary Method :-

1. Find the complement of $(37)_{10}$

→ Here, the number has two digits and the value of Base is 10 Now formula is $(Base)^n - 1$.

$\therefore (10)^2 - 1$
$\therefore 100 - 1$
$\therefore 99$

Now, $99 - 37 = 62$.

Ans:- Complement of $(37)_{10} = (62)_{10}$.

2. $(56)_{10}$

→ $n = 2$.
$(Base)^n - 1$
$(10)^2 - 1$
$100 - 1$
99

Now, $99 - 56 = 43$

Ans:- Complement of $(56)_{10} = (43)_{10}$

3. $(95)_{10}$
$n = 2$.
$(Base)^n - 1$
$(10)^2 - 1$
$100 - 1 = 99$.

Now, 99 - 35 = 64

Ans:- Complement of $(35)_{10} = (64)_{10}$

4. $(53)_{10}$

$n = 2$

$(Base)^n - 1$

$(10)^2 - 1$

$100 - 1$

99

Now, 99 - 53 = 46

Ans:- Complement of $(53)_{10} = (46)_{10}$

* 2. Complement method for subtraction

Rules for complement :-
1. 1's = 0
2. 0's = 1

→ 1. Subtracting smaller no. from a bigger one.

1. $(10010)_2 - (01001)_2$

Step 1 Convert $(01001)_2$ into 1's complement
i.e. $(01001)_2$ complement is $(10110)_2$

Step 2 :- Add this no. into $(10010)_2$

```
  1 0 0 1 0
+ 1 0 1 1 0
-----------
1 0 1 0 0 0
```

1001
- 1001
1001
+ 1001
0(1010)

Step 3 :- when subract smaller number from a bigger name and by adding the second no, you must get a carry. which is dropped and incremented by 1.

```
  0 1000
+       1
-------
  1 001
```

Ans :- (1001)2.

*. 2. Subracting bigger no. from smallerone

(1001)2 - (10011)2.

Step 1 :- Convert (10011)2 into 1's complement i.e. (10011)2 is (01100)2

Step 2 :- Add this no. into (1001)2

```
  0 1 0 0 1
+ 0 1 1 0 0
-----------
1 0 1 0 1
```

Step 3 :- When subract a bigger no. from smaller no. and by adding complement into second number, you always get a result without a carry.

Now again complement the Result and

add - sign.

Complement of result.
10101 = 01010

Ans :- - (01010)2.

3. (1101101)2 - (111011)2.

Step 1:- Convert (111011)2 into 1's complement
i.e. (111011)2 complement is (000100)2

Step 2:- Add this no. into (1101101)2

```
      1
  1 1 0 1 0 1
+ 0 0 0 1 0 0
-------------
  1 1 1 0 0 1
```

Step 3:- when subract a bigger no. from smaller no. and by adding complement into second no., you always get a result without a carry. add - sign.

Complement of result:-
(111001)2 = (000110)2

Ans:- - (000110)2

4. $(10011)_2 - (10010)_2$

Step 1 :- Convert $(10010)_2$ into 1's comp
i.e. $(10010)_2 = (01101)_2$

Step 2 :- Add $(10011)_2$ to $(01101)_2$

```
  1 1 1 1 1
    1 0 0 1 1
+   0 1 1 0 1
-------------
    0 0 0 0 0
```

Step 3 :- Add $(00000)_2$ increment by 1

```
    0 0 0 0 0
+           1
-------------
    0 0 0 0 1
```

Ans :- $(00001)_2 \rightarrow (1)_2$

* Parity Scheme :-

During a transmission of data there is a possibility of errors due to disturbance.

→ Most of this error result in change of 0 to 1 or 1 to 0.

→ For detecting the error parity bit is attached.

(1) → A parity bit is an extra bit which

is added in the binary data such that it makes the total number of 1 either even or odd.

→ Parity scheme for even parity is 1 and for odd parity is 0.

* Character Code :-

→ Code is a symbolic representation of different information which may be represent in form of number, letters or physical quantities.

1. BCD :-
Binary Coded Decimal.
→ In BCD number system each decimal digit is represented by a binary code of 4 digit.
→ Binary weight of the 4 bit is $2^0, 2^1, 2^2, 2^3$

2. EBCDIC :-
Extended Binary coded of Decimal information Code.
→ It was 8 bits for each characters.
→ It was divided into two, 4 bit group.

3. ASCII :- American standard Code of Information Interchange.

4. UNICODE :-

→ This code is popular in data communication and use to represent data in micro computer.

Questions :-

Q1. What is serial ports and parallel ports
Q2. What is port explain USB port in detail.
Q3 What is BIOS [2]
Q4 Define POST [2]
Q5 Define a block diagram of computer and explain all its function unit [5]
Q6 Number System [16][18]
Q7 What is EBCDIC [2]
Q8 What is ASCII [2]
Q9 What is Parity scheme [2]
Q10 Explain Motherboard in detail [5]
Q11 Explain different phases of machine cycle [5]
Q12 Define term BUS and PORT [2]
Q13 What is Database & Address bus [2]
Q14 Functionality of Input unit [2]
Q15 Why computer is also known as dataprocessor